# THE LETHAL EFFECT OF SUGAR SOLUTIONS ON THE CITRUS NEMA, *TYLENCHULUS SEMIPENETRANS* COBB

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## Abstract

Larvae of the citrus nema, *Tylenchulus semipenetrans* Cobb, could be killed to 100% by immersion in 30% or 40% of glucose solution for 12 hours, and by immersion in 50% of glucose solution for 3 hours or more. when concentration of the glucose solution was at 60%, one hour's immersion was able to kill them completely. Larvae immersed in 50% sucrose solution for 24 hours, and in 60% for 12 or 24 hours were completely killed also.

From these results, apparently larvae of the citrus nema, *Tylenchulus semipenetrans* Cobb, are highly resistant to the osmotic destruction of sugar solutions, and control of this nema either by addition of sugar to the soil or by dipping the root and of nursery stock in the sugar solution seems to be not practical.

## Introduction

According to the Feder's report (1), the nematodes of *Panagrellus* sp., *Pratylenchus brachyurus*, *Dolichodorus heterocephalus*, and *Radopholus similis* could be killed to 100% by immersion in 40 or 50% sucrose solution for 1 hour, and the nematode of *Panagrelus* sp. was also killed to 100% by immersion in 10% glucose solution for 1 hour. Steele (2) reported that when cysts of *Heterodera sehachtii* were immersed in 60% sucrose solution for 96 hours the hatch of larvae was reduced only 40%.

The present work was carried out for determining the lethal effect of sucrose and glucose solutions to larvae of the citrus nema. *Tylenchulus semipenetrans* Cobb only.

## Materials and Methods

In this experiment, the glucose and sucrose solutions were used. Concentrations were separated into 10%, 20%, 30%, 40%, 50% and 60% on a weight/volume basis, in each sugar and a tap water was used as a check. Immersion periods consisted of 1 hour, 2 hours, 3 hours, 4 hours, 5 hours, 6 hours, 12 hours, and 24 hours. 100 living larvae of the citrus nema, *Tylenchulus semipenetrans* Cobb, were placed in each watch glass for each treatment. Each treatment was replicated 10 times. Larvae after treatment were immediately placed in tap water 12 hours to allow their recovery, and then the percentage of death was counted. The tests were conducted at room temperatures from 15°C to 20°C.

## Results

The effect of glucose solution on the larvae of the citrus nema is summarized in Table 1. Larvae of the citrus nema immersed in 10% glucose solution for 4 hours began to show their death. Immersion in 30% or 40% of glucose solution for 12 hours,

Table 1. Mean death percentage of larvae of the citrus nema, *Tylenchulus semipenetrans* Cobb, by immersion in various glucose concentrations and for different hours.

| Concentrations of glucose | Mean death percentage by immersion for | | | | | | | | L.S.D. at .05 | L.S.D. at .01 |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 hr. | 2 hr. | 3 hr. | 4 hr. | 5 hr. | 6 hr. | 12hr. | 24hr. | | |
| 0 (check) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | — | — |
| 10 | 0 | 0 | 0 | 8.1 | 8.3 | 10.2 | 14.5 | 22.8 | 8.1 | 10.5 |
| 20 | 0 | 0 | 20.3 | 22.6 | 25.1 | 27.4 | 32.8 | 41.9 | 6.5 | 8.7 |
| 30 | 52.2 | 72.1 | 75.0 | 78.9 | 82.4 | 88.3 | 100.0 | | 5.4 | 7.1 |
| 40 | 75.1 | 85.6 | 95.4 | 98.2 | 98.3 | 99.1 | 100.0 | | 7.6 | 10.0 |
| 50 | 86.0 | 90.2 | 100.0 | | | | | | 3.2 | 4.2 |
| 60 | 100.0 | | | | | | | | — | — |
| L.S.D. at.05 | 9.7 | 8.4 | 8.2 | 7.8 | 5.2 | 6.8 | 4.2 | 4.8 | | |
| L.S.D. at.01 | 12.9 | 10.9 | 10.6 | 10.1 | 6.8 | 8.8 | 5.5 | 6.2 | | |

and in 50% for 3 hours or more were able to cause larvae death to 100%. when concentration of the glucose solution increased to 60%, larvae of the citrus nema were completely killed even only by 1 hour's immersion.

A summary of the effect of different sucrose solutions with various immersion hours on the death percentage of larvae of the citrus nema is presented in Table 2.

Table 2. Mean death percentage of larvae of the citrus nema, *Tylenchulus semipenetrans* Cobb, by immersion in various concertration and for different hours.

| Concentrations of sucrose | Mean death percentage by immersion for | | | | | | | | L.S.D. at .05 | L.S.D. at .01 |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 hr. | 2 hr, | 3 hr. | 4 hr. | 5 hr. | 6 hr. | 12hr. | 24hr. | | |
| 0 (check) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | — | — |
| 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | — | — |
| 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | — | — |
| 30 | 0 | 0 | 0 | 0 | 0 | 0 | 12.4 | 18.6 | 4.5 | 5.9 |
| 40 | 10.2 | 24.7 | 25.3 | 25.8 | 26.6 | 30.2 | 42.8 | 62.0 | 9.4 | 12.4 |
| 50 | 10.5 | 30.4 | 50.6 | 62.1 | 64.4 | 81.7 | 92.8 | 100.0 | 6.1 | 8.1 |
| 60 | 51.1 | 54.9 | 56.7 | 74.4 | 86.1 | 96.5 | 100.0 | 100.0 | 7.2 | 9.5 |
| L.S.D. at.05 | 6.2 | 8.6 | 5.8 | 7.4 | 9.2 | 8.3 | 7.1 | 4.3 | | |
| L.S.D. at.01 | 8.1 | 11.1 | 7.5 | 9.6 | 11.9 | 10.8 | 9.2 | 5.6 | | |

Immersion in 30% sucrose solution for 12 hours initiated larvae death to 12.4%. Larvae immersed in 50% sucrose solution for 24 hours, and in 60% for 12 of 24 hours were completely killed.

## Conclusions

From the results given above, it may be concluded that larvae of the citrus nema, *Tylenchulus semipenetrans* Cobb, are highly resistant to the osmotic destruction of sugar solutions as compared with other nemas reported by Feder (1). Consequently, control of the citrus nema either by addition of sugar to soil or by dipping the roots of nursery stock in the sugar solution seems to be unpractical.

Generally, the higher the concentration or the longer the immersion hour, the more the death percentage of larvae of the citrus nema, but from statistical analysis this fact sometimes was not significant.

Besides, the glucose solution on the lethal effect of larvae of the citrus nema is obviously greater than the sucrose solution.

## 中文摘要

# 糖液對于柑桔線蟲之致死效應

董慕秋

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柑桔線蟲之幼蟲浸于30%或40%之葡萄糖液經12小時后，或浸于50%葡萄糖液經3小時以上，或浸于60%葡萄糖液經1小時以上，方可達100%之死亡率。若將其浸于50%蔗糖液經24小時，或浸于60%蔗糖液經12小時以上，亦能使其全部死亡，由此觀之，柑桔線蟲之幼蟲必須在甚高之糖液濃度下，方能全部受反滲透作用而致死。故欲施用糖份于土中或用糖液浸根以防治柑桔線蟲，在實際應用上，似乎均難施行。

## References

1. Feder, W. A. 1960. Osmotic destruction of plant parasitic and saprophytic nematodes by the addition of sugars to soil. Plant Disease Reporter, 44(12): 883-885.
2. Steele, A. E. 1962. Effects of pretreatment of *Heterodera schachtii* cysts with sugar solutions on emergence of larvae in sugar-beet root diffusate. 46(1): 43-44.